REMARKS

As of this response, claims 1, 2, 21, 22, 24, 26, 29, 31-35, 37, 39, 40 and 41 are pending in the Subject Application. Claims 1, 2, 21, 22, 24, 26, 29, 31-35, 37 and 39 stand rejected in the Subject Application. Claims 40 and 41 are new.

Interview with Examiner

Applicants' representatives express their appreciations and thanks for the courtesies extended during the interview of December 11, 2009. During the interview, additional compositional data were requested to supplement the property data provided in the specification. The additional compositional data are provided herewith in the form of a Declaration of John R. Paules, and are discussed further hereinbelow.

Rejections Under 35 U.S.C. §103(a) – Beguinot and ASM Handbook

Claims 1, 24, 31-35 and 37 were rejected in the Office Action under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,695,576 ("Beguinot") alone, or in the alternative with evidence from the ASM Handbook Volume 1 (the "ASM Handbook").

In regards to claim 1, the Office Action maintains that Beguinot discloses an alloy steel composition with high tensile strength and excellent ductility that has a composition that compares with the composition claimed in the Subject Application. The Examiner repeats the arguments from the Office Action mailed October 1, 2007. In summary, the Examiner provides a table showing overlapping ranges of some of the elements in the Beguinot and Eglin Steel alloys. With respect to missing elements, the Examiner argues that the disclosure in the ASM Handbook that steel intended for forming, drawing or bending would have phosphorous and sulfur contents less than 0.035 wt% and less than 0.040 wt%, and that this means that Beguinot would be expected to have those elements in those amounts. The Examiner maintains that a *prima facie* case of obviousness is established (*See*, MPEP 2144.05).

With respect to the limitations of the alloy steel having an ultimate tensile strength of 233-270 ksi, Charpy V-notch impact strength of 20-43 ft-lb at -40ºF, and a ductility low rate strain to failure of 16.6% to about 18.4%, the Examiner maintains that Beguinot, with evidence from the ASM Handbook Volume 1 discloses an overlapping composition, a substantially similar method of production, and tensile strengths from above 1200 MPA (174 ksi) up to 1945 MPa (282 ksi) (col. 2, lines 1-5 and col. 8, lines 20-45). The Examiner maintains, therefore, that a Charpy V-Notch impact strength of 20-43 ft-lb at -40ºF, and a ductility low rate strain to failure of 16.6% to about 18.4% would be expected, citing MPEP 2112.01 I.

Applicants maintain that the production methods disclosed in Beguinot and those in the Subject Application are not substantially similar, and that therefore the same properties would not necessarily be expected. The differences in the processes disclosed in Beguinot and in the Subject Application are elaborated upon *infra*.

Considering the compositions, a *prima facie* case of obviousness resulting from overlapping ranges can be rebutted if the Applicant can show a criticality of the range with evidence of unexpected results.[1, 2] An unexpected result is one that a person having ordinary skill in the art would have found surprising.[3]

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[1] *In re* Wertheim, 541 F.2d 257, 267, 191 USPQ 90, 100 (C.C.P.A. 1976) (ranges which overlap or lie inside ranges disclosed by the prior art may be patentable if the applicant can show criticality in the claimed range by evidence of unexpected results).

[2] *In re* Peterson, 315 F.3d 1325, 1330 (Fed. Cir. 2003) citing *In re* Geisler 116 F.3d at 1469-70, 43 USPQ2d at 1365 (alteration in original) (quoting *In re* Woodruff, 919 F2.d at 1578, 16 USPQ2d at 1936) (In general, an applicant may overcome a *prima facie* case of obviousness by establishing "that the [claimed] range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range").

[3] *In re* Soni, 54 F.3d 746, 750, 34 USPQ2d 1684, 1687 (Fed. Cir. 1995) ([o]ne way for a patent applicant to rebut a prima facie case of obviousness is to make a showing of 'unexpected results, *i.e.*, to show that the claimed invention exhibits some superior property or advantage that a person of ordinary skill in the relevant art would have found surprising or unexpected).

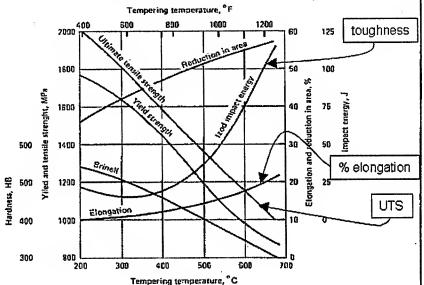
While not admitting that the Examiner established a *prima facie* case of obviousness, Applicants respectfully maintain that they rebutted any proposed *prima facie* case of obviousness based on overlapping composition ranges, and established criticality of the claimed ranges by the unexpected results delineated in their response dated March 27, 2008 ("the March 27 Response"), containing data from the Subject Application. Applicants repeat their fact based rebuttal herein and provide actual chemical compositional data for Eglin Steels labeled ES-1 through ES-5 in the Subject Application. The compositional data is actual measured chemistry of the five heats, ES-1 through ES-5, and is submitted in the form of a Declaration of John Paules in an attempt to clarify the unexpected results, which effectively rebut the Examiner's asserted *prima facie* case of obviousness.

Applicants note that the results in the Table 3 of the Subject Application were obtained from compositional variants of five different heats based on the compositional ranges found in Table 1 of the Subject Application (*See*, ¶ [0019]). Therefore, in the first instance, Applicants submit that the totality of the compositional ranges of all of the specified elements in Table 1 of the Subject Application, which is exemplified by the "typical chemistry" found in Table 2, are critical to the unexpected results outlined in the March 27, 2008 response, and summarized herein below.

Applicants provided data in the March 27 Response that demonstrated that the Examples of steel disclosed in Beguinot did not possess both the high strength and high ductility of steel as recited in the claims of the Subject Application. Importantly, Applicants maintained that a person having ordinary skill in the art would not have expected to produce a high strength material the also has high ductility, as recited in the independent claims of the Subject Application. The state of the art at the time of the invention of the Subject Application was presented in the March 27 Response as **Slide 3**, and is reproduced immediately hereinbelow with modification for clarification.

Correlation of Tensile Elongation and Impact Energy (Toughness)

Fig. 30 Effect of tempering temperature on mechanical properties of 4340 steel



Variation with tempering temperature of room-temperature mechanical properties of 4340 steel. Specimens 25 mm (1 in.) in diameter were oil hardened from 830 °C (1525 °F) and tempered at the indicated temperature.

Source: ASM Metals Handbook, Ninth Edition

A person having ordinary skill in the metallurgical arts at the time of the invention would have know that the percent elongation and the degree of toughness in low alloy carbon steel are inversely proportional to the ultimate tensile strength (UTS), as shown in the schematic directly above. The same person of ordinary skill would also have known that percent elongation (% elongation) is a measure of ductility and that the percent elongation of a low alloy carbon steel is directly proportional to the toughness, as depicted on the schematic directly above. It would have also been known to the person of ordinary skill that Izod impact energy measurements and Charpy V-notch strength measurements are two different methods for measuring the degree of toughness, and that the measurements obtained from each test are directly proportional.

Applicants further demonstrated that the steel recited in the claims of the Subject Application has both high strength (UTS) and high ductility (as measured by low rate strain to failure, which is equivalent to % elongation), constituting a result that would have been **unexpected** and **surprising** to a person having ordinary skill in the art. Factual evidence of this unexpected result was provided in **Slide 1** of the March 27 Response, using data from the Subject Application and from Beguinot. However, only a "typical" composition found in Table 2 of the Subject Application was attributed to the mechanical properties found in Table 3 for Eglin Steel recited in the claims.

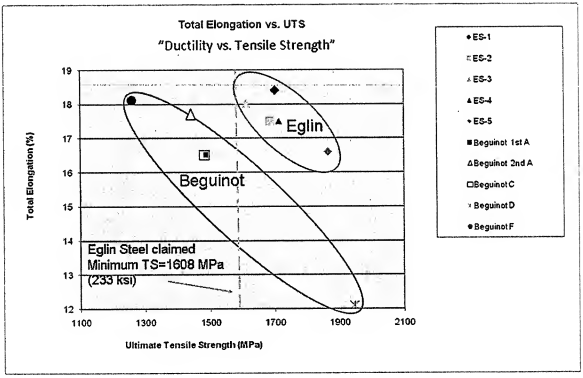
Applicants now rely on the Declaration of John Paules, dated December 23, 2008 ("the Declaration"), and submitted with these Remarks, to provide actual compositions for the five heats of the Subject Application, ES-1 through ES-5, for which mechanical property data were provided in the Subject Application. The actual measured chemical compositions of heats ES-1 through ES-5 of Eglin Steel are found in the following table.

Composition of Five Sample Heats of Eglin Steel in Subject Application										
	C	S	Mn	Si	Cr	Ni	Mo	Cu	V	W
ES-1	0.24	0.0007	0.53	1.05	2.59	1.01	**0.42**	0.006	0.085	**0.99**
ES-2	0.26	0.0007	**0.06**	**0.02**	2.97	1.03	-	0.008	0.28	2.93
ES-3	**0.22**	0.0007	0.50	**0.17**	2.96	1.02	-	0.008	0.26	2.94
ES-4	0.26	0.0006	0.50	**0.17**	2.96	1.01	-	0.008	0.26	2.94
ES-5	0.28	0.0006	0.50	1.00	2.96	1.00	-	0.008	0.27	2.98

Applicants note that the compositions of the heats ES-2 through ES-5 are within the ranges recited in pending independent claim 1, but not within the ranges recited in independent claims 2, 24, and 39. Independent claims 1, 2, 24, and 39 were amended during prosecution of the Subject Application to overcome alleged relevant prior art concerning, *inter alia*, the compositional range for the element tungsten. Applicants submit new independent claim 40 which contains the composition of ES-1 through ES-

5. No new matter is added. The compositional range for tungsten in claim 40 of "about 0.70% to about 3.25%" was recited claim 1 of the as-filed Subject Application. More discussion on new claims 40 and 41 is provided in the *New Claims* section, *infra*. Therefore, the chemical composition ranges provided for heats ES-1 through ES-5 in the Declaration are encompassed in the pending independent claims.

The following graph illustrates the unexpected results of high ductility, as measured in % elongation, and high strength for Eglin Steel using the actual compositions provided in the Declaration with the mechanical test data found in Table 3 of the Subject Application, compared with the high strength or high ductility results for the steel of Beguinot.

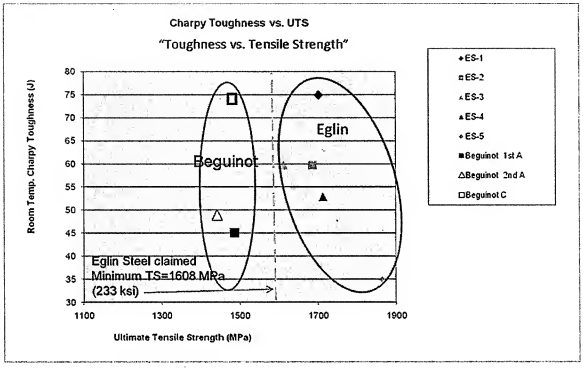


Elongation versus strength data for the steel of Beguinot are seen to fall within one ellipse, whereas the comparable data for Eglin Steel fall in a clearly distinct ellipse on the elongation versus strength plot. The data for Eglin Steel are grouped into an area of both high strength and high ductility on the plot, whereas the steel of Beguinot has either high strength or high ductility. *The properties of the steel of Beguinot follow*

those which were known by a person having ordinary skill in the art at the time of the invention, *i.e.*, the percent elongation of a low alloy carbon steel is inversely proportional to the ultimate tensile strength of the steel. Surprisingly, by using the total composition ranges claimed in the Subject Application, together with employing heat treatment processes that are not-substantially similar to those of Beguinot (*See infra*), Applicants had the unexpected result of producing a steel that exhibits high tensile strength **and** high percent elongation. Factual evidence of an unexpected result has been submitted, and is recited in the independent claims of the Subject Application. Ranges which overlap or lie inside ranges disclosed by the prior art may be patentable if the applicant can show criticality in the claimed range by evidence of unexpected results.[4] Applicants have clearly provided evidence of unexpected results and respectfully submit that the asserted *prima facie* case of obviousness based on Beguinot, or Beguinot and the ASM Handbook has been effectively rebutted.

Applicants presented Slide 2 in the March 27 Response that shows the relationships of Charpy toughness to ultimate tensile strength for the steel of Beguinot and the steel claimed in the Subject Application. Applicants now use the actual compositional data of heats ES-1 through ES-5 from the Declaration, together with the Charpy toughness data in Table 3 of the Subject Application for a comparison of room temperature Charpy toughness versus tensile strength of Eglin Steel with that of the Steel of Beguinot. These data are presented in the immediately following plot. Applicants note that room temperature Charpy toughness is used in this comparison since Beguinot does not provide Charpy toughness at -40°F, which is recited in the independent claims of the Subject Application. A person having ordinary skill in the art would know that toughness decreases as temperature is lowered. Therefore, the trends of the room temperature data for toughness of Beguinot and of Eglin Steel are representative for trends that would be expected at -40°F.

[4] *In re* Wertheim at 267.



Unfortunately, Beguinot did not disclose a Charpy toughness value for Sample D, which had the highest ultimate tensile strength of the Beguinot steel samples. However, for the Beguinot samples that have reported Charpy toughness values, it is readily apparent that the steel having compositions recited in the claims of the Subject Application (Eglin Steel) has a higher strength and toughness combination than any of the steels disclosed in Beguinot. Surprisingly, by using the composition ranges claimed in the Subject Application, together with non-substantially similar processing (*See infra*), Applicants had the unexpected result of producing a steel that exhibits high tensile strength **and** high toughness. Thus, factual evidence of an unexpected result has been submitted, proving that the Applicants have demonstrated criticality of the claimed composition range of the low alloy carbon steel in the Subject Application, rebutting the Examiner's asserted *prima facie* case of obviousness based on the disclosure of Beguinot, or Beguinot in combination with the ASM Handbook.

Applicants' disclosure and claims are not a mere optimization of a material's mechanical properties since Applicant surprisingly produced a low alloy carbon steel having a composition that exhibits both high strength and high toughness, which had

not been previously disclosed, and which is not disclosed or suggested in Beguinot, with or without the ASM Handbook Volume 1, as demonstrated hereinabove.

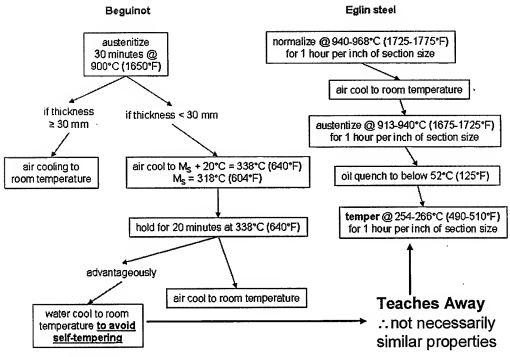
Alternatively, to further rebut the Examiner's *prima facie* case of obviousness based on overlapping ranges of specific elements, Applicants particularly look to the criticality of tungsten, as specified in paragraph [0016] of the Subject Application. Specifically, tungsten is added to the claimed compositions of the Subject Application to enhance strength and wear resistance. The Examiner notes in various tables in the Office Action that Beguinot discloses tungsten in a range of 0-6 wt%. According to Beguinot, "tungsten [is] not absolutely necessary" (Beguinot, col. 5, lines 13-14). There are no examples in Beguinot that use tungsten as an alloying element.

Applicants specifically **require** 0.70 to 3.25 wt%, or 1.17 to 3.25 wt%, or 1.17 wt% tungsten in their claimed compositions. Applicants maintain that because tungsten is required by Applicants and is not necessary for the composition of the steels of Beguinot that the composition ranges of tungsten in the claims of the Subject Application and the tungsten range of Beguinot do not effectively overlap. While Beguinot has disclosed the use of tungsten, Beguinot has not enabled the use of tungsten. A person having ordinary skill in the art would not have known or surmised from Beguinot, or Beguinot with the ASM Handbook, that a range of 0.70 to 3.25 wt% of tungsten is required to obtain the high strength and high toughness properties recited in the claims of the Subject Application. Applicants note that the claimed ranges of 0.70 to 3.25 wt% and 1.17 to 3.25 wt% tungsten is commensurate in scope with the experimental data of ES-1 through ES-5 tested at 0.99 to 2.98% tungsten. This is evidence that the unexpected mechanical property results are obtained for substantially all of the critical range of tungsten recited in independent claims 1, 2, 24, 39, and 40. A *prima facie* case of obvious is rebutted by Applicants showing that the unexpected results are commensurate in scope with the claimed range. *In re* Peterson, 315 F.3d 1325, 1330, 65 USPQ.2d 1379, 1383 (Fed. Cir. 2003) (citing *In re Greenfield*, 571 F.2d1185, 1189, 197 USPQ 227, 230 (CCPA 1978)) (quoting *In re Tiffen*, 58 C.C.P.A. 1420, 448 F.2d 791, 792, 171 USPQ 294, 294 (CCPA 1971)). At least for this reason,

Applicants have presented factual evidence that rebuts the *prima facie* case of obviousness based on overlapping ranges as asserted by the Examiner in the Office Action.

The Examiner states at page 4 of the Office Action, that Beguinot, with evidence from the ASM Handbook Vol. 1, discloses an overlapping composition, a substantially similar method of production, and tensile strengths from above 1200 MPA (174 ksi) up to 1945 MPa (282 ksi). The Examiner concludes that the Beguinot alloy would therefore have a Charpy V-notch impact strength of about 20-43 ft-lb at -40°F and a low rate strain-to-failure of about 16.6% to about 18.4%. The Examiner cites MPEP 2112.01 I.

Applicants do not agree that the steel disclosed in Beguinot and the steel disclosed and claimed in the Subject Application are produced by identical or substantially similar processes. The process of Beguinot and that of the Subject Application (Eglin Steel) are different, and the two different processes would be expected by a person ordinarily skilled in the art to produce different microstructures in the respective steels, further resulting in different properties. A comparison of the different properties is provided immediately below in process flow charts.



Differences include, *inter alia*, a tempering step in the Eglin Steel of the Subject Application, whereas no tempering step is disclosed in the steel of Beguinot. In fact, Beguinot **teaches away** from tempering. Beguinot discloses that "the slow transit near M_S may advantageously be carried out by water cooling so as to limit as far as possible the **self-tempering** of the structure obtained (Beguinot, col. 6, lines 63-67). Beguinot teaches the practitioner to avoid tempering, whereas tempering is a required last step for the steel of the Subject Application. A *prima facie* case of obviousness may be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. *In re* Geisler, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). Therefore, the teaching away by Beguinot concerning tempering adds to the evidence that any asserted *prima facie* case of obviousness is effectively rebutted.

Further, after the austenizing step, the process of Beguinot utilizes a hold at the martensite start temperature (M_s), a process known in the art as marquenching, whereas the process used for Eglin Steel is air quenched directly to room temperature to reduce the amount of retained austenite phase. A person having ordinary skill in the art would not expect that the two steels made by two clearly different thermomechanical

processes would necessarily have the same microstructure or the same mechanical properties, such as the same Charpy V-notch toughness properties.

The evidence presented hereinabove demonstrates that the processes of Beguinot and the process disclosed in the Subject Application are strikingly different. The Examiner has not provided any evidence as to how the processes of Beguinot and the process disclosed in the Subject Application are substantially similar. Therefore, the Examiner has not established a *prima facie* case of obviousness.

The Office Action, again relying on Beguinot and the ASM Handbook rejected tensile strength claims 32-35 on the bases of overlapping composition ranges, and substantially similar methods of production. Applicants have hereinabove provided evidence of unexpected results and the criticality of the composition ranges recited in the claims of the Subject Application, thereby rebutting the asserted *prima facie* case of obviousness. Applicants have further demonstrated that the processes of Beguinot and those of the Subject Application are not substantially similar, but are strikingly different and that Beguinot teaches away from the process disclosed in the Subject Application, providing further evidence to rebut the asserted established *prima facie* case of obviousness. For these reasons, one having ordinary skill in the art would not necessarily expect the tensile strengths of the steel of Beguinot to exhibit the high low rate strain-to-failure values and the high Charpy V-notch values that are recited in claim 1 of the Subject Application, from which claims 32-35 depend, as was asserted in the Office Action. These are evidence of unexpected results that rebut all claims of *prima facie* obviousness asserted in the Office Action.

The Office Action maintains that Beguinot with evidence from the ASM Handbook renders claim 37 obvious, and that the steel of Beguinot would have a low rate strain-to-failure of 16.6 to about 18.4%. The Office Action maintains that the ranges overlap and that the processes are substantially similar. Applicants, hereinabove, have adequately demonstrated that the claims of the Subject Application recite a critical composition range for all of the elements of the composition, or alternatively, for the element of tungsten, and that the critical composition ranges provide unexpected results.

Applicants have also adequately demonstrated that the processes are not substantially similar, and that Beguinot actually teaches away from the processes disclosed in the Subject Application. The plot of total elongation versus ultimate tensile strength presented hereinabove explicitly shows that the steel of Beguinot does not have a low rate strain to failure / percent elongation of 16.6 to about 18.4% when the ultimate tensile strengths of the steel of Beguinot and that recited in the claims of the Subject Application are similar. The sample Beguinot D has an ultimate tensile strength that is above 1900 MPa, but has a low rate strain-to-failure / percent elongation of only about 12%. Clearly, the low rate strain to failure / percent elongation of the Beguinot steel is not equivalent to the steel recited in claim 37 of the Subject Application.

Applicants have effectively demonstrated that claims 1, 24, 31-35 and 37 are not rendered obvious by Beguinot, or by Beguinot with the ASM Handbook. Applicants request withdrawal of the rejections of claims 1, 24, 31-35, and 37, and early allowance of claims 1, 24, 31-35, and 37. Claim 21 depends from independent claim 1, which is in condition for allowance. Therefore claim 21 is in condition for allowance. Claim 26 depends from independent claim 24, which is in condition for allowance. Therefore claim 26 is in condition for allowance. Applicants request withdrawal of the rejections to claims 21 and 26, and early allowance of claims 21 and 26.

Rejections Under 35 U.S.C. §103(a) – Beguinot, ASM Handbook, and Yoshie

Claims 2, 29, and 39 were rejected in the Office Action under 35 U.S.C. § 103(a) as being unpatentable over Beguinot alone, or in the alternative with evidence from the ASM Handbook Volume 1 (the "ASM Handbook") in view of U.S. patent number 5,454,883 ("Yoshie"). The Office Action maintains that Beguinot, or Beguinot with the ASM Handbook discloses overlapping ranges and substantially similar process, and further maintains that Beguinot, or Beguinot with the ASM Handbook disclose a steel alloy that would be rapidly cooled to form martensite, but does not disclose the addition of copper. The Office Action maintains that Yoshie discloses copper, and therefore claims 2, 29, and 39 are rendered obvious when combined with Beguinot, or Beguinot with the ASM Handbook.

Applicants have effectively argued hereinabove that Beguinot, or Beguinot with the ASM Handbook, does not render claims 1, 24, 31-35 and 37 obvious. The same arguments equally apply to and are asserted for claims 2, 29, and 39. Since the claims of the Subject Application recite a critical range of composition that produces unexpected results, which are elements of the claims, and since the processes of Beguinot and the processes disclosed in the Subject Application are not substantially similar, and since Yoshie does not anticipate nor render Applicants' unexpected results obvious, the addition of Yoshie does not render the claims of the Subject Application obvious.

At least for the reasons presented herein above, Applicants maintain that claims 2, 29, and 39 are not made obvious by Beguinot, or Beguinot with the ASM Handbook, in view of Yoshie. Applicants request withdrawal of the rejections of claims 2, 29, and 39, and early allowance of claims 2, 29, and 39. Claim 22 depends from independent claim 2, which is in condition for allowance. Therefore claim 22 is in condition for allowance. Applicants request withdrawal of the rejection to claim 22, and early allowance of claim 22.

Rejections Under 35 U.S.C. §103(a) – Beguinot, ASM Handbook, and Lyon

Claims 21 and 26 were rejected in the Office Action under 35 U.S.C. § 103(a) as being unpatentable over Beguinot alone, or in the alternative with evidence from the ASM Handbook, in view of U.S. patent number 2,942,339 ("Lyon"). The Office Action maintains similar reasons for rejection as for claims 1, 24, 31-35 and 37, *i.e.*, the Office Action maintains the claims recited in the Subject Application have overlapping compositional ranges and substantially similar processes with Beguinot, or Beguinot with the ASM Handbook, but does not disclose using the steel for bomb casings. The Office Action maintains that Lyon discloses using low-carbon steels having high strength and ductility for making bomb casing, and therefore claims 21 and 26 are rendered obvious by Beguinot, or Beguinot with the ASM Handbook, in view of Lyon.

Applicants are not able to discern where Lyon discloses using a steel with high

strength and ductility for making bomb casings. Lyon only discloses that the tubular bomb casing is made from "rolled steel plate such as low carbon steel or the like" (Lyon, col. 1, lines 45-47). Applicants demonstrated herein above that a person having ordinary skill in the art would have expected low carbon steel to have either high strength or high ductility. Applicants respectfully request that the Examiner specify the location in Lyon that discloses using steel with high strength and ductility. If this is not possible, then the Examiner has not established a *prima facie* case of obviousness, and the claim rejections should be withdrawn.

Alternatively, and not admitting that a *prima facie* case of obviousness has been established, Applicants have effectively argued hereinabove that Beguinot, or Beguinot with the ASM Handbook, does not render claims 1, 24, 31-35 and 37 obvious. The same arguments equally apply to and are asserted for claims 21, which depends from allowable independent claim 1, and for claim 26, which depends from allowable claim 24. Since the claims of the Subject Application recite a critical range of composition that produces unexpected results, which are elements of the independent claims, and since the processes of Beguinot and the processes disclosed in the Subject Application are not substantially similar, the addition of Lyon does not render the claims obvious.

At least for the reasons presented herein above, Applicants maintain that claims 21 and 26 are not made obvious by Beguinot, or Beguinot with the ASM Handbook, in view of Lyon. Applicants request withdrawal of the rejections of claims 21 and 26, and early allowance of claims 21 and 26.

Rejections Under 35 U.S.C. §103(a) – Beguinot, ASM Handbook, Yoshie, and Lyon

The Office Action rejects claim 22 under 35 U.S.C. § 103(a) as being unpatentable over Beguinot, or Beguinot with the ASM Handbook in view of Yoshie and Lyon.

Applicants have effectively argued hereinabove that Beguinot, or Beguinot with the ASM Handbook, does not render claims 1, 24, 31-35 and 37 obvious. The same

arguments equally apply to and are asserted for claim 22, which depends from allowable independent claim 2. Therefore, the addition of Yoshie and Lyon does not render claim 22 obvious. Applicants request withdrawal of the rejections of claim 22, and early allowance of claim 22.

New Claims 40 and 41

Applicants have added new claims 40 and 41. New claim 40 recites the limitation that the range of tungsten is "about 0.70% to about 3.25%". New claim 41 incorporates this same range. This range finds support in the Subject Application in Table 1. This range was also in original claim 1, but was amended during prosecution to overcome a § 103(a) rejection over Gondo (U.S. Patent 3,574,602) (*See* Applicants response dated January 16, 2007). Applicants maintain that all of the arguments regarding critical composition ranges with evidence of unexpected results asserted for the independent claims 1, 2, 24, and 39 equally apply to claims 40 and 41 and are asserted against Gondo. Gondo teaches steels having strengths up to 159 Kg/mm^2 (226 ksi). This does not overlap the range of 233-270 ksi recited in claim 40, and therefore Gondo does not render claim 40 obvious. Further, Gondo provides no disclosure of a method. It would not be proper to assume that the method of Gondo was substantially similar to the rather unconventional low temperature tempering method disclosed in the Subject Application. Therefore, it follows that the steel of Gondo would not necessarily have the same toughness and ductility as that recited in claim 40 and any asserted *prima facie* case of obviousness over Gondo would be rebutted. Section 2112.01 I of the MPEP states that a "*prima facie* case can be rebutted by evidence showing that the prior art products do not necessarily posses the characteristics of the claimed product" (emphasis in original). At least for these reasons, Applicants submit that claim 40 and 41 are in condition for allowance, and Applicants request early allowance of claims 40 and 41.

Declaration of John Paules

The Declaration of John Paules, attached herewith, provides the actual chemistry

for the five heats of Eglin Steel, ES-1 through ES-5, for which measured mechanical properties are provided in the Subject Application. It is noted from the table entitled "Composition of Five Sample Heats of Eglin Steel in Subject Application" and the plots comparing the mechanical properties of the steels of Beguinot that those of Eglin Steel, *supra*, that the individual heat chemistries provide additional data as evidence for unexpected results. John Paules observes that the plots with mechanical properties demonstrate that the steel of Beguinot exhibits high strength or high ductility/toughness, whereas the Eglin Steel exhibits high strength, high ductility, and high toughness. John Paules declares that the combination of properties for Eglin Steel is surprising and unexpected for a skilled practitioner, since the strength of low alloy carbon steels is generally recognized to be inversely proportional to the ductility and toughness, as exhibited by the steel of Beguinot. The data presented in the plots with mechanical properties clearly show that the composition of the steel recited in the independent claims of the Subject Application, together with a non-substantially similar process disclosed in the Subject Application, provide unexpected results for a critical composition range, which effectively rebuts the asserted *prima facie* case of obviousness due to overlapping composition ranges.

The Declaration of John Paules also demonstrates that the Eglin Steel recited in the Subject Application and the steel of Beguinot have different microstructures. Eglin Steel utilizes a low tempering temperature (400-500ºF) in combination with high Si and W contents to produce a balance of high strength of between 233-270 ksi and good toughness. As declared by John Paules, the microstructure of the Eglin Steel contains about 4-5% austenite with the remainder consisting of lightly tempered martensite and lower bainite. The steel disclosed by Beguinot contains untempered bainite and/or martensite, and from 5-30%, preferably 10% to 20% of austenite having a high carbon content (See, Beguinot, column 4, lines 17-19). John Paules declares that the difference in microstructure would yield different properties, which contribute to the high strength **and** high ductility **and** high toughness of the Eglin Steel, which are not disclosed by Beguinot, as explained hereinabove. The difference in microstructure of the steel of Beguinot and the Eglin Steel further rebuts the Examiner's asserted *prima*

facie case of obviousness for all of the pending claims. The unique microstructure and retained austenite content of Eglin Steel are documented in a paper entitled "Development of Eglin Steel—A New Ultrahigh-Strength Steel for Armament and Aerospace Applications", by J. R. Paules, M. Dilmore, and K. J. Handerhan, published in the Proceedings of the Materials Science and Technology Conference, 2005, published by ASM, which is attached as Exhibit A. It is noted that Figure 7 of Exhibit A suggests that the retained austenite in Eglin steel is 4-6%, but in footnote 1 of the Declaration of John Paules, Mr. Paules notes that commercial Eglin steel is austenized at 950ºC, and as such has no more than about 5% retained austenite.

John Paules further declares that the combination of high ultimate tensile strength and high toughness and ductility are critical for certain applications. Mr. Paules further declares that the Charpy impact strength properties and the percent elongation of the steel disclosed by Beguinot are not as high as in Eglin Steel. The steel disclosed in Beguinot has either high strength or high ductility, compared with Eglin Steel, which has high strength and high ductility. John Paules ultimately declare that notwithstanding overlap in the ranges of some elements, the unique combination of elements in the amounts disclosed, and claimed in the Subject Application, together with the processing parameters, and in particular, the low temperature tempering step used with Eglin Steel produces a steel microstructure that results in a unique and unexpected combination of mechanical properties, which are critically different than those disclosed in Beguinot.

Conclusion

Applicants have made every effort to advance prosecution of the Subject Application. No amendments have been made to the claims after the final rejection in the Office Action. The claims are believed to be in condition for allowance. Reconsideration and allowance of claims 1, 2, 21, 22, 24, 26, 29, 31-35, 37, 39, 40, and 41 are respectfully requested. If the undersigned can be of any assistance to the Examiner in advancing the application to allowance, the Examiner is urged to contact the undersigned attorney at the number set forth below.

Respectfully submitted,

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(Attachments, 1 Declaration, 1 NPL)